Crystal Clock Generator Operating at Third Overtone of Crystal's Fundamental Frequency

Abstract

A crystal oscillator operates at the third overtone of the crystal's fundamental frequency. A value of a shunt resistor between the two phase-shift leg nodes is chosen so that the absolute value of the product gm x (Xc1) x (Xc2) is greater than the effective reactance of the crystal, where gm is the gain of the amplifier attached to the phase-shift legs, and Xc1 and Xc2 are the effective capacitive reactances of phase-shift legs at nodes X1 and X2. The third overtone is doubled by a multiplier and the final output filtered to remove the third overtone and select a frequency six times the fundamental frequency. A pair of Colpitts or Pierce amplifier half circuits is attached to the phase-shift leg nodes. The leg nodes can be capacitively isolated from Pierce-amplifier circuit nodes to improve start-up. Frequency doubling can be performed by summing currents from the two oscillator half circuits.